

**Table 1. Comparison of variable averages between the lightly grazed and heavily grazed sites.**

Variable	Lightly grazed	Heavily grazed
Stream width (feet)	1.8	7.8
Stream depth (inches)	6.2	1.3
Bank water depth (inches)	5.1	0.4
Water velocity (fps)	1.3	0.8
Gravel (percent)	69.3	98.2
Fine sediment (percent)	28.2	2.9
Channel gradient (percent)	0.7	1.2
Bank angle (degrees)	82.0	132.0
Bank undercut (inches)	1.7	0.6
Artificial streambank alteration (units)	5.7	86.1
Habitat type rating (units)	17.7	14.0
Vegetative use (percent)	2.3	37.3

Alteration of the streambank was rated visually using a defined rating system.

The riparian habitat measurements include rating the streambank habitat type. The rating is based on the dominant and subdominant plant or soil composing the streamside environment as it would affect the fishery. A streamside habitat of sand (dominant)/sand (subdominant) is considered to have the least value to salmonids and is rated 1. A brush (dominant)/sod (subdominant) habitat is considered to have the most value and is rated a 24. The other streambank habitat types range between these ratings. Use of streamside vegetation was a visual estimate of the percent of vegetation used or altered by animals within 5 feet of the streambank.

### Results

The results in Table 1 and the channel profiles in the drawing show definite differences between the lightly grazed

and heavily grazed sites. The stream was over four times as wide in the heavily grazed area as in the lightly grazed area. Sheep use on the streambanks in the heavily grazed meadow caused the banks to erode away, resulting in over four times as much water surface being exposed to solar radiation as was the case in the stream research in the lightly grazed meadow. Average stream depth was almost five times as great in the lightly grazed area as in the heavily grazed area. The depth of the stream at the streambank stream channel interface was almost 13 times as great in the lightly grazed meadow.

### Discussion

Sheep are often classified as animals who prefer slopes and upland areas for grazing. Therefore, under proper management, they would be expected to have little on-site effect on riparian-stream environments. This study shows, however, that when sheep were forced in the past to concentrate on a riparian-stream area, which is contrary to proper management, they adversely affected the stream environment. Heavy concentrated sheep grazing can make streams wider and shallower, outslope the streambanks, eliminate undercut banks, change riparian habitat type, expose the stream to more solar radiation, and decrease water depths at the stream surface-streambank interface. Fishery biologists generally agree that the documented changes tend to decrease fish populations. Therefore, to concentrate sheep on meadows for long periods of time is probably detrimental to the riparian-stream ecosystem.

Under a grazing strategy such as deferred use combined with good herding, there should be few if any detrimental effects on the fishery. The Forest Service has reduced sheep grazing and holding time on the study site. Under this new management, it is my judgment that the stream has been constantly improving. ●

# Summer Grazing of Sagebrush-Grass Range by Sheep—a Photo Record

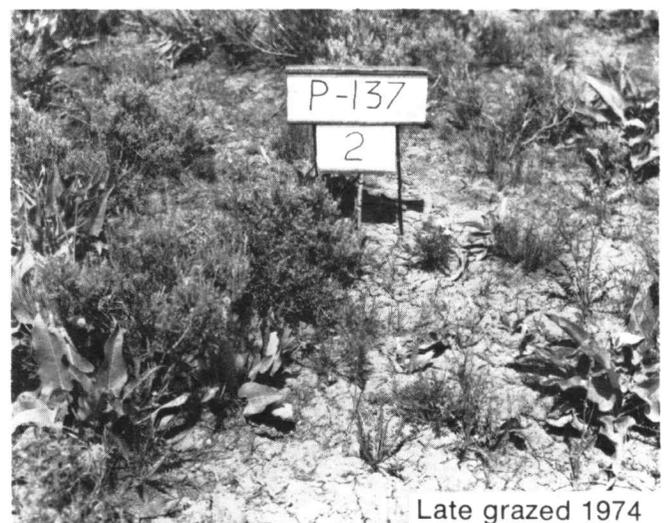
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At the U.S. Sheep Experiment Station in Dubois, Idaho, we examined the possibility of grazing traditional spring-fall sagebrush-grass sheep range in the summer as a maintenance ration for ewes weaned early of their lambs. Sheep grazed two sagebrush subtypes from July 7 to September 10 at about 80 sheep days per acre over a 10-year period. The grazing rate was very heavy to accelerate the vegetation change due to grazing. Photographic and plot

data were taken to document the effects of this grazing during a 3-week period in early summer and late summer. Records were kept on ewe weights during both early and late summer on similar sagebrush range grazed at a rate of about 40 sheep days per acre.

The plot and animal data are reported in more detail in a companion paper (Harniss and Wright, in press). Following the adage "that a picture is worth a thousand words," we present photographs here that depict the trends over the 10 years in the balsamroot subtype of sagebrush.

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Ungrazed, early grazed, and late grazed pastures from 1965 to 1974 in the sagebrush subtype with balsamroot. Heavy grazing increased sagebrush and decreased grasses in the early summer in this subtype. Ground cover did not change from the heavy grazing pressure over the 10 years of this study.

Heavy early summer grazing after 10 years increased the production of sagebrush and decreased the production of grasses. There was no change in sagebrush or grass production under late summer grazing. Forb production and the percent of the pasture in bare ground did not change in the balsamroot subtype, but bare ground increased in the pricklygilia subtype of sagebrush.

The ewes, in general, maintained their weight throughout the summer, with a slight gain during early summer grazing and a slight loss during late summer grazing. There was little difference in reproduction, life span, wool production, or lambs marketed when these sheep were compared with sheep grazed on high mountain summer range (Doyle et al.,

in press).

We concluded that sheep could graze sagebrush-grass in the summer on range similar to this at about 35 to 40 sheep days per acre without damage to the range or sheep. Necessary considerations would include supplemental feed or irrigated pasture for the lambs and range to carry the ewes in the spring, summer, and fall seasons.

### References

- Doyle, J.J., D.A. Price, H.A. Wright, and D.O. Everson. Responses of ewes and lambs to different management systems in the mountain summer and sagebrush-grass ranges. *J. Range Manage.*
- Harnis, R.O., and H.A. Wright. Summer grazing of sagebrush-grass range by sheep. *J. Range Manage.*

## True Prairie—Past and Present

John Gunderson

Each year thousands of people travel throughout Minnesota and when they travel the southern and western parts of the state, they are in Minnesota's "Corn Belt."

Each year thousands of acres of Minnesota's "Corn Belt" are planted to corn, beans, sunflowers, small grains, and other crops. Minnesota's farmers spend countless hours in the field working on this valuable agricultural landscape.

Today many people are beginning to realize this "Corn Belt" landscape was formerly the "True Prairie" (or the Tall Grass Prairie). Yet many still ask the question "Where is the 'Tall Grass Prairie'?" They do not recognize they are living on it, raising crops on it, and traveling through it.

Years ago the prairie grasses grew so tall one had to be on horseback to see above them—thus, the name "Tall Grass Prairie". These tall grasses could exist under severe conditions. The soils were rich, but water was scarce. Droughts resulting from hot dry winds and periodic low rainfalls limited the growth of trees to areas along streams and marshes. The grasses were free from disease and, regardless of the weather, were hardy enough to survive. Particular species of tall grasses found in Minnesota were Big Bluestem, Yellow Indiangrass, and Switchgrass. Little Bluestem and Sideoats Grama grew on the hillsides and sandy glacial areas. Wildflowers and a few scattered shrubs were also found. These prairie plants were able to withstand the problem of inadequate water supply by developing deep root systems. These same root systems are partly responsible for the development of the prairie soils as one of the state's richest natural resources.

Originally, the Tall Prairie occupied a strip of land from Canada to Mexico which was 150 to 500 miles wide. However, the Tall Grass Prairie region proved to be so desirable for cultivation that today it is plowed almost in its entirety. Only those areas too wet or too rocky have not been cultivated.

But the observant land user and outdoor enthusiast can still spot clues of the true Tall Grass Prairie. The same Bluestem grasses, Indiangrass, and prairie wildflowers can be seen in small prairie cemeteries, old railroad beds, road ditches, and some pastures. And they can be seen increas-



*The author examining Yellow Indiangrass. The stand was planted in 1978 and seed was harvested in 1980. Native warm-season grasses provide excellent wildlife habitat and give citizens an opportunity to view the landscape as our forefathers observed it.*

ingly on federal lands administered by the U.S. Fish & Wildlife Service from Stearns County in the north to Jackson and Cottonwood Counties to the south.

The U.S. Fish and Wildlife Service is managing these prairie grass areas especially to provide beneficial habitat for wildlife found in Minnesota. "Native" tall grasses are planted on newly acquired lands to protect the soils and provide safe nesting cover for waterfowl, upland game birds, and as fawning areas for deer. Other non-game birds and animals also need this prairie habitat in the same way their ancestors did before the "Tall Grass Prairie" became the "Corn Belt."

The Fish and Wildlife Service is helping to preserve and restore areas of this grassland not only for wildlife benefit but also for the pleasure of Minnesotans and visitors to the state. With a little imagination and an observant eye as we travel throughout Minnesota's agricultural regions, we can almost visualize the awesome "Tall Grass Prairie" abundant in wildlife as our forefathers saw it when they came to Minnesota in the 1800's. ●

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